

Mathematics Toolkit: Grade 7 Objective 5.B.1.a

Standard 5.0 Knowledge of Probability

Topic B. Theoretical Probability

Indicator 1. Determine the probability of an event comprised of no more than 2 independent events

Objective a. Express the probability of an event as a fraction, a decimal, or a percent

Assessment Limits:

Use a sample space of no more than 35 outcomes and decimals with no more than 2 decimal places

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Scoring Rubric

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Clarification

Mathematics Grade 7 Objective 5.B.1.a Assessment Limit 1

Probability is the chance or likelihood of an event happening. The outcomes are all the possible results of an activity, either theoretical or experimental, that can occur. When rolling two number cubes, there are 36 possible sums of the cubes that can occur. Those 36 sums produce 11 unique results called the sample space of the activity. An event is a specific set of outcomes from the activity. When rolling two number cubes there are 6 possible sums of 7 that can occur. We talk about rolling a 7 as an event. An event composed of one single event is called a simple event. A simple event occurs when you roll one number cube and determine whether you get a 5. An event composed of more than one event occurring at the same time is called a compound event. A compound event occurs when you roll two number cubes to determine if the sum of the numbers shown on the cubes is 7.

Classroom Example 1

When rolling two number cubes, there are 36 sums (outcomes) of the numbers shown on the cubes. This is a compound event made up of two events, rolling cube 1 and rolling cube 2. The sample space for the sums of the numbers shown on the cubes when rolling two number cubes is {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}.

| | | Number Cube 2 | | | | | |
|---------------|---|---------------|---|---|----|----|----|
| Number Cube 1 | + | 1 | 2 | 3 | 4 | 5 | 6 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

What is the probability of rolling a 7?

Answer:

According to the chart in which the possible outcomes are recorded, there are 6 different ways to roll a 7: 1+6, 2+5, 3+4, 4+3, 5+2, and 6+1. There is a $\frac{6}{36}$ chance you will get a sum of 7 when you roll two number cubes. This may be thought of as 6 out of 36 chances.

$$P(\text{sum of 7}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}} = \frac{6}{36}$$

Classroom Example 2

What is the probability of rolling a sum greater than 10?

Answer:

$$P(\text{sum of a number greater than 10}) = \frac{3}{36}$$

Classroom Example 3

Use the Fundamental Counting Principle to justify that there are 36 possible sums when rolling two number cubes.

Answer:

There are 6 possible ways number cube 1 can be rolled. There 6 possible ways number cube 2 can be rolled. According to the Fundamental Counting Principle, there are $6 \cdot 6$ or 36 combinations, or sums, of the numbers from cube 1 and cube 2.

Sample Item #1 - Selected Response (SR) Item

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To get dressed, Melanie randomly chooses a blouse from her dresser drawer. Then, she randomly chooses a blue skirt from her closet. Melanie has a $\frac{2}{9}$ probability of being dressed in a blue blouse and blue skirt.

Which blouses does Melanie have in her dresser drawer, and which skirts in her closet, to result in a probability of $\frac{2}{9}$?

- A. Drawer - 2 blue blouses and 1 black blouse
Closet - 1 red skirt, 1 green skirt, and 1 black skirt
- B. Drawer - 2 blue blouses and 1 red blouse
Closet - 2 blue skirts and 1 brown skirt
- C. Drawer - 1 blue blouse, 1 green blouse, and 1 red blouse
Closet - 2 blue skirts and 1 red skirt
- D. Drawer - 1 blue blouse, 1 red blouse, and 1 green blouse
Closet - 1 black skirt, 1 brown skirt, and 1 blue skirt

Correct Answer:

C

Sample Item #2 - Selected Response (SR) Item

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Jose needs to pick a golf ball and golf club. He has 3 white golf balls and 1 yellow golf ball. Jose has 3 black-handled golf clubs and 2 yellow-handled golf clubs. What is the probability that he randomly selects a yellow golf ball and a yellow-handled golf club?

- A. 10%
- B. 25%
- C. 40%
- D. 50%

Correct Answer:

A

Answer Annotation

- A. 10% (correct answer)
- B. 25% (only golf ball)
- C. 40% (only club handle)
- D. 50% (thinks 50-50)

Sample Item #3 - Selected Response (SR) Item

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The local weather report states that the probability of snow today is 10% and snow tomorrow is 30%. What is the probability that it will snow today and snow tomorrow?

- A. .10
- B. .03
- C. 10
- D. 30

Correct Answer:

B

Answer Annotation

- A. .10 (snow today)
- B. .03 (correct answer)
- C. 10 (percent snow today)
- D. 30 (percent snow tomorrow)

Sample Item #4 - Brief Constructed Response (BCR) Item

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Juan has 5 pairs of socks in his drawer. The pairs of socks are: 3 white and 2 blue. He also has 4 T-shirts in the drawer: 2 white and 2 gray. He randomly picks one pair of socks and one T-shirt from the drawer.

Step A

What is the probability Jose picks a pair of white socks and a gray T-shirt?

Step B

Use what you know about probability to explain how you determined the probability of Jose picking a white pair of socks and a gray T-shirt. Use words, numbers, and/or symbols in your explanation.

Answer Annotation

Step A Answer: $\frac{3}{10}$ or equivalent

Step B Sample correct response: Since there are 5 pairs of socks and 3 pairs are white, the probability of selecting a pair of white socks is 3 favorable outcomes (white pair of socks) out of 5 total number of outcomes (total pairs of socks) or $\frac{3}{5}$. The probability of





selecting a gray T-shirt is 2 out of 4 or $\frac{1}{2}$. The probability of selecting a pair of white socks

and a gray T-shirt is $\frac{3}{5} \cdot \frac{1}{2} = \frac{3}{10}$.

Sample Item #5 - Selected Response (SR) Item

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Michael wins a prize if he spins and lands on blue. Each spinner is divided into 6 equal sections. Which spinner gives Michael the greatest chance of winning a prize?

- A. 
- B. 
- C. 
- D. 

Correct Answer:

C

Rubric - Brief Constructed Response (BCR)

Score 2

The response demonstrates a complete understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated.
- Explanation¹ of and/or justification² for the mathematical process(es) used to solve a problem is clear, developed, and logical.
- Connections and/or extensions made within mathematics or outside of mathematics are clear.
- Supportive information and/or numbers are provided as appropriate.³

Score 1

The response demonstrates a minimal understanding and analysis of a problem.

- Partial application of a strategy in the context of the problem is indicated.
- Explanation¹ of and/or justification² for the mathematical process(es) used to solve a problem is partially developed, logically flawed, or missing.
- Connections and/or extensions made within mathematics or outside of mathematics are partial or overly general, or flawed.
- Supportive information and/or numbers may or may not be provided as appropriate.³

Score 0

The response is completely incorrect, irrelevant to the problem, or missing.⁴

Notes:

- ¹ Explanation refers to students' ability to communicate how they arrived at the solution for an item using the language of mathematics.
- ² Justification refers to students' ability to support the reasoning used to solve a problem, or to demonstrate why the solution is correct using mathematical concepts and principles.
- ³ Students need to complete rubric criteria for explanation, justification, connections and/or extensions as cued for in a given problem.
- ⁴ Merely an exact copy or paraphrase of the problem will receive a score of "0".

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